In the Claims

Applicant has submitted a new complete claim set showing marked up claims with insertions indicated by underlining and deletions indicated by strikeouts and/or double bracketing.

1.   (Currently amended) A reference source comprising:

a first bipolar transistor circuit having one or more bipolar transistors for operation at a first, high current density to provide an output V_{be1},

a second bipolar transistor circuit having one or more bipolar transistors for operation at a second, lower current density than that of the first transistor block to provide an output V_{ben} ,

a first control circuit,

a second control circuit,

a current source, and

a current sink,

wherein outputs of the first and second transistor circuits are fed to the first and second control circuits, the first control circuit being adapted to control the current provided by the current source and the second control circuit being adapted to control the current provided by the current sink, and outputs of the current source and current sink being combined to provide an output of the reference source.

2.   (Original) The reference source as claimed in claim 1 wherein the current source and current sink provide outputs equal to a scaled difference between the outputs of the first and second transistor circuits.

3.   (Original) The reference source as claimed in claim 2 wherein the output of the current source is defined by the equation:

$$N1V_{be1} - N2V_{ben}$$

where N1>N2, and the output of the current sink is defined by the equation

$$N3V_{ben} - N4V_{be1}$$

where N3>N4.

4.   (Currently amended) The reference source as claimed in claim 3 wherein the output of the reference source is defined by the equation:

$$(N1+N4)V_{be1} - (N2+N3)V_{ben} \; .$$

5.   (Original) The reference source as claimed in claim 1 wherein the first and second control circuits may be adapted to provide the output as a predominant PTAT or CTAT output.

6.   (Original) The reference source as claimed in claim 1 wherein the output is provided as a current reference output.

7.   (Original) The reference source as claimed in claim 1 wherein the output is provided as a voltage reference output.

8.   (Original) The reference source as claimed in claim 5 wherein each of the first and second control circuits includes at least one amplifier.

9.   (Original) The reference source as claimed in claim 8 wherein a first resistor is coupled to a non-inverting input of an amplifier of the first control circuit and a second resistor is coupled to an inverting input of an amplifier of the second control circuit, the ratio of the first and second resistors determining the predominance of PTAT to CTAT at the output.

10.   (Currently Amended) The reference source as claimed in claim 1 wherein:

the first bipolar transistor circuit includes a stacked arrangement of transistors, and

the first control circuit includes an amplifier, the stacked arrangement of transistors being

coupled to the non-inverting input of the amplifier via [[the]] a first resistor, and the output of the

amplifier being coupled to a current mirror to provide the current provided by the current source.

11.   (Original) The reference source as claimed in claim 10 wherein the output of the

amplifier is coupled to a first pair of MOSFETs, the current provided at the first MOSFET of the

pair by the amplifier being replicated to form an output of the second MOSFET of the pair, and

the output of the second MOSFET being replicated across a current mirror, defined by a second

pair of MOSFETs.

12.   (Original) The reference source as claimed in claim 1 wherein the second bipolar

transistor circuit is coupled to a non-inverting input of an amplifier component of the second

control circuit, the output of the amplifier component controlling the gate of a MOSFET

transistor to provide the current provided by the current sink.

13.   (Currently Amended) The reference source as claimed in claim 1 wherein:

the first bipolar transistor circuit includes a stacked arrangement of transistors,

the first control circuit includes an amplifier, the stacked arrangement of transistors being

coupled to the non-inverting input of the amplifier via [[the]] a first resistor, and the output of the

amplifier being coupled to a current mirror to provide the current to the current source,

the second bipolar transistor circuit is coupled to a non-inverting input of an amplifier

component of the second control circuit, the output of the amplifier component controlling the

gate of a MOSFET transistor to provide the current provided by the current sink, and

the second bipolar transistor circuit is additionally coupled to the inverting input of the

amplifier of the first control circuit.

14.   (Original) The reference source as claimed in claim 1 wherein the circuit components are implemented in CMOS technology.

15.   (Currently amended) A method of providing a reference source for a circuit requiring a reference source, the method comprising ~~the following steps~~:

   providing a first bipolar transistor circuit having one of more bipolar transistors for operation at a high current density to provide an output V_{be1},

   providing a second bipolar transistor circuit having one ~~o~~for more bipolar transistors for operation at a lower current density than that of the first transistor ~~block~~circuit to provide an output V_{ben} ,

   providing a first control circuit,

   providing a second control circuit,

   providing a current source, and

   providing a current sink,

wherein outputs of the first and second transistor circuits are fed to the first and second control circuits, the first control circuit being adapted to control the current provided by the current source and the second control circuit being adapted to control the current provided by the current sink, outputs of the current source and current sink being combined to form an output of the reference source, and the output of the reference source being provided to the circuit requiring the reference source.

16.   (New) The method of claim 15 wherein the current source and current sink provide outputs equal to a scale difference between the outputs of the first and second transistor circuits.

17.   (New) The method of claim 16 wherein the output of the current source is defined by the equation:

$$N1V_{be1} - N2V_{ben}$$

where N1>N2, and the output of the current sink is defined by the equation

$$N3V_{ben} - N4V_{be1}$$

where N3>N4.

18.   (New) The method of claim 17 wherein the output of the reference source is defined by the equation:

$$(N1+N4)V_{be1} - (N2+N3)V_{ben}$$.

19.   (New) The method of claim 15 wherein the first and second control circuits may be adapted to provide the output as a predominant PTAT or CTAT output.

20.   (New) The method of claim 15 wherein the output of the reference source is provided as a current reference output.

21.   (New) The method of claim 15 wherein the output of the reference source is provided as a voltage reference output.

22.   (New) The method of claim 19 wherein each of the first and second circuits includes at least one amplifier.

23.   (New) The method of claim 22 further including coupling a first resistor to a non-inverting input of an amplifier of the first control circuit and coupling a second resistor to an inverting input of an amplifier of the second control circuit, the ratio of the first and second resistors determining the predominance of a PTAT to CTAT characteristic at the output of the reference source.

24.   (New) The method of claim 15 wherein:

the first bipolar transistor circuit includes a stacked arrangement of transistors; and

the first control circuit includes an amplifier, the stacked arrangement of transistors being coupled to the non-inverting input of the amplifier via a first resistor, and the output of the amplifier being coupled to a current mirror to provide the current provided by the current source.

25.   (New) The method of claim 24 wherein the output of the amplifier is coupled to a first pair of MOSFETs, the current provided at the first MOSFET of the pair by the amplifier being replicated to form an output of the second MOSFET of the pair, and the output of the second MOSFET being replicated across a current mirror, defined by a second pair of MOSFETs.

26.   (New) The method of claim 15 wherein the second bipolar transistor circuit is coupled to a non-inverting input of an amplifier component of the second control circuit, the output of the amplifier component controlling the gate of a MOSFET transistor to provide the current provided by the current sink.

27.   (New) The method of claim 15, wherein:

the first bipolar transistor circuit includes a stacked arrangement of transistors,

the first control circuit includes an amplifier, the stacked arrangement of transistors being coupled to the non-inverting input of the amplifier via [[the]] a first resistor, and the output of the amplifier being coupled to a current mirror to provide the current to the current source,

the second bipolar transistor circuit is coupled to a non-inverting input of an amplifier component of the second control circuit, the output of the amplifier component controlling the gate of a MOSFET transistor to provide the current provided by the current sink, and

the second bipolar transistor circuit is additionally coupled to the inverting input of the amplifier of the first control circuit.

28.   (New) The method of claim 15 wherein the circuit components are implemented in
CMOS technology.